NOTES

The Body Temperature of Wild *Rattus* spp. on the Island of Hawaii

During the course of a recent study concerning methods for the control of sylvatic plague in the Hawaiian Islands (Kartman and Lonergan, World Health Organ. Bul., in press), data were obtained on body temperatures of rats inhabiting Kaunamano Gulch in the Hamakua District of the Island of Hawaii. The rats concerned, *Rattus norvegicus*, *R. rattus* subspecies and *R. hawaiiensis*, were captured alive, subjected to ether anaesthesia (rarely to chloroform) and processed for certain physical data. Rectal temperatures were obtained with a mercury-filled glass thermometer after the animal had become quiescent. With few exceptions, temperature determinations were made at planes just below consciousness. This was fortunate since deeper planes of anaesthesia are thought to depress body temperature. Hypothermic effects in small animals are also known to be induced by certain microorganisms (Olitzki *et. al.*, 1942, Jour. Immunol. 45: 237–248). The rats reported on here were not affected by any known infection, but the presence of "inapparent" or asymptomatic plague cannot be excluded (Meyer *et al.*, 1943, Jour. Infect. Dis. 73: 144–157) even though it was not thought to have a high degree of probability.

Table 1 shows the body temperatures of these rats in relation to arbitrary weight classes. The data are based on the first capture of each animal. Although the mean body temperature of all individuals in each species was 37.6°C., animals in the lowest weight class (youngest) for each species had lower mean body temperatures. Although this may be due to the fact that younger animals have a more variable body temperature since they are in the process of acquiring homoeothermal ability it may have some relevance to current hypotheses concerning weight-temperature relations in mammals (Rodbard, 1950, Science 111: 465–466; 1953, Science 117: 256–257; Morrison and Ryser, 1952, Science 116: 231–232).

The overall mean body temperature of these wild rats closely approximates that recorded for the laboratory rat which is generally thought to be about 37.5°C. This correlation may be expected insofar as the commensal species are concerned, but it seems surprising in regard to the native *Rattus hawaiiensis*. Furthermore, the mean body temperature of *R. exulans* on the island of Guam was found to be about 35.9°C. (Baker, 1946, Ecol. Monog. 16: 393–408), and this species is closely related to the Hawaiian

TABLE 1

Temperature (C.) of *Rattus* spp. by Weight Classes

	Rattus hawaiiensis			*Rattus rattus**		*Rattus norvegicus*	
Weight Class (Gm.)	Number examined	Mean	Weight Class (Gm.)	Number examined	Mean	Number examined	Mean
0–29	25	36.4	0–99	61	37.0	11	37.2
30–59	121	37.7	100–199	95	37.9	28	37.7
60–89	86	37.9	200–299	4	37.8	9	37.6
Total	232	37.6	Total	160	37.6	48	37.6

* *Rattus rattus rattus* and *R. r. alexandrinus.*

TABLE 2
TEMPERATURE (C.) OF *Rattus* SPP. BY SEX

	Rattus hawaiiensis		*Rattus rattus**		*Rattus norvegicus*	
	Number examined	Mean	Number examined	Mean	Number examined	Mean
Male	97	37.5	81	37.5	29	37.4
Female	135	37.7	79	37.6	19	37.9

* *Rattus rattus rattus* and *R. r. alexandrinus*

rat. On the other hand, a rat closely allied to the *R. rattus* group, *R. mindanensis*, also has been found to have a mean body temperature of 35.9°C. on Guam (Baker, 1946, *ibid.*). The reasons for these discrepancies are not known, but different environmental temperatures on Guam and Hawaii may be responsible in part.

It is of interest to note that the mean body temperature of both species of rats on Guam was 36.4°C. for females and 35.5°C. for males. No such wide differences were noted on Hawaii although the females tended to have slightly higher mean body temperatures than the males (Table 2).

Data from individual rats recaptured more than once indicated a marked variation in body temperature. Rectal temperatures in °C. of rats recaptured on the dates shown are given in the following examples:

Rattus hawaiiensis; Adult ♀; 7–1–52, 37.5°; 7–9, 37.8°; 8–14, 38.0°; 8–21, 38.1°; 10–15, 38.0°; 10–23, 37.0°. Adult ♂; 12–16–52, 37.8°; 1–13–53, 39.0°; 2–17, 38.8°; 2–18, 36.1°.

Rattus rattus; Adult ♂; 12–10–52, 37.8°; 12–11, 38.1°; 2–10–53, 38.2°; Juvenile ♀; 2–15–52, 39.0°; 2–18, 39.4°; 2–21, 37.8°; 3–4, 38.6°; 3–7, 37.2°; 3–19, 38.9°.

Rattus norvegicus; Adult ♂; 12–5–52, 36.8°; 12–16, 37.6°; 12–17, 37.6°; 12–18, 36.6°.

These data are not unexpected since studies on the laboratory rat have shown that the animal does not regulate its body temperature efficiently (Donaldson, 1924, Amer. Anat. Mem. [Wistar Inst.] No. 6 [2nd ed.]). The variable rectal temperature of small, warm blooded animals may suggest that the animal is in part poikilothermous. Nevertheless, this most probably is not a valid inference since these small animals show a profound physiological regulation but their adjustment to environmental changes is subject to varying degrees of thermal inertia (Herrington, 1940, Amer. Jour. Physiol. 129: 123–139). On the other hand, all warm-blooded species have a diurnal cycle and measurements at different periods in their cycle may affect the temperature. This may account in part for the variability in body temperatures observed here.

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News Note

The Geophysical Society of Hawaii, which is also the Mid-Pacific Region of the American Geophysical Union, will hold a Regional Meeting in Honolulu November 15 through 17, 1955. The meeting will be held in conjunction with a national meeting of the American Meteorological Society, and it is anticipated that a program based principally on various aspects of tropical meteorology, agricultural meteorology, meteorological forecasting, cloud physics, oceanography, hydrology, volcanology, and seismology will be established.

Persons interested in obtaining further information or in presenting papers at the meetings should get in touch with the secretary of the Geophysical Society of Hawaii, Larry Eber (Pineapple Research Institute, Honolulu, Hawaii), or the president, John F. Mink (P. O. Box 48, Honolulu, Hawaii).